MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole 50-05-11

Borehole Information

Farm : T **Tank :** T-105 **Site Number :** 299-W10-121
N-Coord : 43,592 **W-Coord :** 75,761 **TOC Elevation :** 672.14
Water Level, ft : 120.1 **Date Drilled :** 8/31/1973

Casing Record

Type : Steel-welded Thickness, in. : 0.237 ID, in. : 4
Top Depth, ft. : 0 Bottom Depth, ft. : 123

Type : Steel-welded Thickness, in. : 0.280 ID, in. : 6
Top Depth, ft. : 0 Bottom Depth, ft. : 123

Cement Bottom, ft. : 123 **Cement Top, ft. :** 0

Borehole Notes:

Borehole 50-05-11 was originally drilled in August 1973 and completed to a depth of 92 ft using 6-in.-diameter casing. In March 1981, this borehole was deepened to 123 ft using 6-in.-diameter casing. During the extension activities, the original 6-in. casing was perforated from 0 to 20 ft and 80 to 123 ft, a 4-in. casing was installed inside the 6-in. casing, and the annular space was filled with grout.

The top of the casing is the zero reference for the SGLS, which is even with the ground surface.

Equipment Information

Logging System : 1B **Detector Type :** HPGe **Detector Efficiency:** 35.0 %
Calibration Date : 10/1997 **Calibration Reference :** GJO-HAN-14 **Logging Procedure :** MAC-VZCP 1.7.10-1

Logging Information

Log Run Number : 1 **Log Run Date :** 04/16/1998 **Logging Engineer:** Bob Spatz
Start Depth, ft.: 0.0 **Counting Time, sec.:** 200 **L/R :** L **Shield :** N
Finish Depth, ft. : 21.5 **MSA Interval, ft. :** 0.5 **Log Speed, ft/min.:** n/a

Log Run Number : 2 **Log Run Date :** 04/17/1998 **Logging Engineer:** Bob Spatz
Start Depth, ft.: 20.5 **Counting Time, sec.:** 200 **L/R :** L **Shield :** N
Finish Depth, ft. : 72.0 **MSA Interval, ft. :** 0.5 **Log Speed, ft/min.:** n/a

Log Event A

Borehole 50-05-11

Log Run Number :	3	**Log Run Date :**	04/20/1998	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	122.5	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	86.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	4	**Log Run Date :**	04/21/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	87.5	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	71.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

The borehole was logged in four runs on April 16, 17, 20, and 21, 1998. The total depth of the borehole was measured at 122.7 ft. The total logging depth was 122.5 ft. This borehole contained standing water below 120.1 ft during logging.

Analysis Information

Analyst : R.G. McCain

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 08/28/1998

Analysis Notes :

The pre-survey and post-survey field verification measurements met acceptance criteria established for peak shape and system efficiency. Energy and resolution calibrations from appropriate verification spectra were used to establish the channel to energy conversion and peak resolution parameters used in processing the spectra acquired during the logging operation.

The casing correction factor for a 0.50-in.-thick steel casing was applied to the concentration data during the analysis process. This casing correction factor was applied because it most closely matched the 0.517-in. total combined thickness of the 4-in. and 6-in. casings. A grout correction was not made because none is available. A water correction was not applied because none is available for 4-in.-diameter boreholes. Use of this casing correction factor will cause radionuclide concentrations to be underestimated.

Log Plot Notes:

Separate plots show the man-made and naturally occurring radionuclides. Concentrations are shown as apparent concentrations to reflect the uncertainty associated with the dual casing and annular grout. The headings of the plots identify the specific gamma lines used to calculate concentrations. Uncertainty bars in the plots show statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plot indicate the MDL, which represents the lowest concentration at which positive identification of a gamma ray peak is statistically defensible.

A combination plot includes man-made and natural radionuclides, the total gamma count rate derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma log plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of selected historical gross gamma-ray data collected between 1975 and 1988 is presented.

Results/Interpretations:

The radionuclide concentrations identified in this section are reported as apparent concentrations only and are underestimated.

The man-made radionuclides Cs-137 and Co-60 were detected around this borehole. Cs-137 contamination was detected intermittently from the ground surface to 3 ft. The apparent Cs-137 concentrations ranged from 0.2 to 2 pCi/g. The maximum apparent Cs-137 concentration for this borehole was 2 pCi/g detected at the ground surface.

Co-60 contamination was detected intermittently between 57 and 64 ft. The apparent Co-60 concentrations ranged from 0.07 to 0.25 pCi/g. Co-60 contamination was detected nearly continuously between 86.5 and 102.5 ft ranging in concentration from 0.07 to 0.4 pCi/g. The maximum apparent Co-60 concentration for this borehole was 0.4 pCi/g detected at 100.5 ft.

The plot of the naturally occurring radionuclides shows variable K-40 concentrations from the ground surface to 38 ft that range between 8 and 12 pCi/g. The K-40 concentrations increase from a general background of about 11 pCi/g at 38 ft to about 14 pCi/g between 38 and 51 ft. Between 52 and 81 ft, the K-40 concentrations range between 11 and 12 pCi/g. Between 82 and 90 ft, the Th-232 concentrations increase and the K-40 concentrations increase to about 13 pCi/g. K-40 concentrations decrease to about 2 pCi/g from 90 to 95 ft and 100 to 105 ft, which coincides with a drop in the Th-232 concentrations. Between 100 and 105 ft, the U-238 concentrations increase. Below 120 ft, the KUT concentrations increase.